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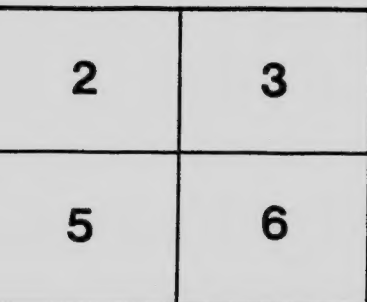
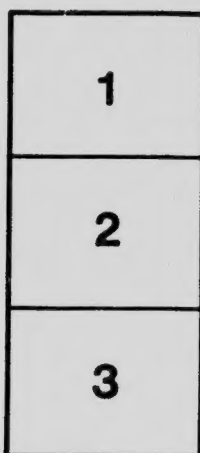
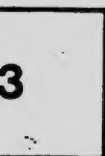
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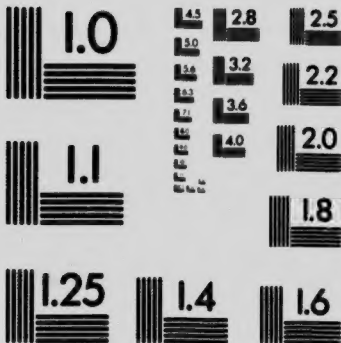
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DOMINION EXPERIMENTAL FARMS.

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FISH MEAL AS A LIVE STOCK FOOD.

By E. S. ARCHIBALD,

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This is a foodstuff as yet little known in Canada and the United States, but which is used extensively and most satisfactorily in Scotland, England, France, Norway, Germany and other European countries. Undoubtedly the thrifty condition of cattle and swine consuming fish waste in countries where fishing is one of the main industries first attracted agricultural investigation on this subject. However, it was found that sheep, swine and calves fed on raw fish and fish wastes produced meats of a yellow colour and strong flavour unless the fish was boiled or cooked with potatoes. The application of this knowledge to the growing fish industry is responsible for the manufacture of fish meal feeds, which industry is rapidly reaching large proportions in these countries.

Fish meal should not be confounded with "fish scrap", "guano" or "pomace" or other forms of fish by-products used as fertilizers. The fish meal used as a foodstuff is more carefully treated and includes, or should include, only fresh, sound fish or fish offal. When rancid fish are used the resulting meals contain too much oil, which, in its rancid state, causes digestive troubles as well as off-flavoured meats, milk and eggs. The oil extraction is not only a profitable process, but much improves the value of the meal. Any fresh, untainted fish or fish wastes will make a fair meal, the value depending on the richness of the flesh and the parts of the fish used. Although usually made from herring, cod, dogfish or other salt water fish, yet when the supply is sufficient, fresh water fish are used. The enormous supply of dogfish on the Atlantic coast, the great salmon industries on the Pacific coast and the sardine or other fish industries wherever they exist offer great opportunities for the manufacturing of fish meal.

Fish meal varies in composition, depending on its source. The richest meal is made from whole fish, while the poorest meal is made from such wastes as heads, tails and fins. One good brand of fish meal made from fresh whitefish showed an analysis of 61.5 per cent protein, oil 3 per cent and 19.8 per cent phosphate of lime. It will be seen that the protein content of this meal was nearly twice as great as that of average cottonseed meal or linseed oil meal as commonly found on the Canadian market.

The feeding value of fish meal depends on its very high content of digestible protein which renders it most suitable for combination with foods such as roots, potatoes, hay, straw and the starchy cereal grains and their by-products such as corn, corn bran, barley, etc., all of which contain a low percentage of protein.

Experience has shown that so long as the quantities fed were not too large, fish meal has proven a valuable food for horses, cattle, sheep, swine and poultry. From many feeding trials the quantities per day which may be fed with a starchy ration have been suggested:—

Cattle—2 pounds per 1,000 pounds live weight.

Swine— $\frac{1}{4}$ to $\frac{1}{2}$ pound per animal.

Sheep— $\frac{1}{10}$ to $\frac{1}{8}$ pound per 100 pounds live weight.

However, it must be remembered that, as in the case of other rich meals, the animals must be brought up to these rations gradually. It should also be remembered that the manure from animals fed on this meal has a very high value in view of the large amount of nitrogen and phosphates in this food.

FISH MEAL FOR SWINE.

This meal may be fed at the rate of $\frac{1}{4}$ to $\frac{1}{2}$ pound per pig per day. It should be introduced into the ration very gradually. It is best used with young and fattening pigs, but it stimulates the appetite of pigs of all ages. Being rich in phosphates it stimulates the growth of bone in young stock.

FINISHING HOGS.

At the Central Experimental Farm, Ottawa, Ont., an experiment to illustrate the value of fish meal for finishing swine was made in 1915. Although, owing to the fact that it took some time to accustom the pigs to this feed, very slow gains were made at first, yet the gains were, on the whole, most satisfactory.

Lot 6 fed a meal mixture of shorts 400 pounds, barley 400 pounds, fish meal (Grimsby brand) 85 pounds required 287 pounds of the meal mixture and 554 pounds skim-milk for 100 pounds gain.

Lot 1 fed a mixture of shorts 400 pounds, barley 400 pounds, corn 200 pounds required 239 pounds meal mixture and 467 pounds milk for 100 pounds gain.

Lot 2 fed the same mixture as Lot 1, but with gluten feed in place of corn, required 229 pounds meal and 439 pounds milk per 100 pounds gain.

The above trial was brief and definite conclusions can scarcely be drawn therefrom. However, although the fish meal did not give quite as good returns as gluten feed or ground corn, yet the pigs made excellent and cheap gains thereon. With corn and gluten feed at present prices, fish meal would thus be worth over \$48 per ton. Finally, it was not expected that fish meal would show as advantageously in this ration as one containing more meals and grains of a higher starch content.

F. S. Ashbrook, U. S. Department of Agriculture, reports on finishing hogs. An addition of 1 part tankage or fish meal to 9 parts corn showed the tankage lot requiring 462 pounds grain and the fish lot only 393 pounds grain per 100 pounds gain.

Keenan reports in 1910 that fish meal sharpens the appetite and produces the same gains as a high grade meat meal.

The Seale-Hayne Agricultural College report trials showing fish meal as an addition to a grain ration composed largely of corn as being responsible for extra gain of $\frac{1}{4}$ to $\frac{1}{2}$ pound per pig per day.

FOR GROWING SHOATS.

Another experiment at the Central Experimental Farm, Ottawa, was conducted with younger shoats and using a "hog meal" containing 65 per cent fish meal, as prepared by the Conservation Commission, Ottawa.

Lot 1 fed a meal mixture composed of shorts 400 pounds, corn 400 pounds, "hog meal" 100 pounds required 270 pounds meal and 310 pounds skim-milk per 100 pounds gain.

Lot 2 fed the same meal mixture without milk required only 290 pounds meal per 100 pounds gain. This lot made greatest gains of all lots.

Lot 3 fed a meal mixture composed of shorts 200 pounds, corn 200 pounds, dried distillers' grains 100 pounds required 160 pounds meal and 330 pounds milk per 100 pounds gain. This lot made the slowest gains, and at the completion of the trial the pigs were poorest grown and in the poorest condition to start the finishing period.

In this trial again fish meal as contained in the special "hog meal" showed cheap and economical production. The excellence of the fish meal as a milk substitute was most pronounced. All pigs on fish meal made the greatest gains and were in the best condition.

FOR WEANING PIGS.

At the same Farm an experiment was conducted with young pigs weaned in June, the same "hog meal" containing 65 per cent fish meal being used. A standard grain ration composed of equal parts corn, shorts and oats was used in all lots.

Lot 1 fed standard grain ration and skim-milk required 151 pounds meal and 529 pounds milk per 100 pounds gain. This lot made greatest gains.

Lot 2 fed standard grain and 10 per cent tankage and milk required 150 pounds meal and 560 pounds milk per 100 pounds gain.

Lot 3 fed the same as Lot 2, but with the "hog meal" replacing tankage made almost exactly the same gains and on the same quantities of both meal and milk.

In this trial, the addition of either fish meal or tankage to a well balanced grain ration fed with milk showed no increase in gains for meal consumed. However, with the present scarcity and high prices of oats, shorts and even skim-milk, fish meal, if available, might well be used as a partial substitute.

F. S. Ashbrook, U. S. Department of Agriculture, reports on trials with growing hogs. As an addition of 1 part tankage or fish meal to a ration of corn, 4 parts, and wheat middlings, 4 parts, the tankage lot required 362 pounds grain, and the fish meal lot 365 pounds grain per 100 pounds gain. This trial again showed fish meal and tankage of about equal value.

Klein also reports fish meal an excellent substitute for milk.

The above figures show that a high grade fish meal may be economically used in balancing rations for all ages of feeding hogs. It will give about the same results as tankage for growing pigs, and makes an equally good substitute for skim-milk. It is fully equal to tankage for finishing hogs and does not impart any fishy odour or flavour to either the fresh pork or lard.

FISH MEAL FOR DAIRY CATTLE.

This feed may be given to beef or dairy cattle up to 2 pounds daily per 1,000 pounds live weight, but the animals must be accustomed to it very gradually. Many European and American investigators report its value in milk production, showing its superiority over an equal weight of cottonseed and linseed oil meal in milk produced and that no flavours were imparted to the milk or fat.

At the Experimental Farm, Ottawa, Ont., in 1916, an experiment was conducted comparing fish meal with other concentrates in the production of milk. In this trial "Grimsby brand" fish meal was used, and after the first few feeds it was eaten with increasing relish and the appetite of the animals increased perceptibly.

For this work the basis of the meal mixture throughout the experiment was a mixture of wheat bran 400 pounds, gluten feed 200 pounds, ground oats 200 pounds. The additions to this basic meal ration during the various periods were: 1, fish meal, 10 per cent addition; 2, gluten feed 24 per cent addition, 3, cottonseed meal 15 per cent addition, 4, linseed oil meal 21 per cent addition, and 5, peanut oil meal 13 per cent addition.

The results of this trial, in brief, are as follow:—

Compared with gluten feed (23 per cent protein), fish meal required 1.1 pounds meal mixture less per 100 pounds milk produced and 39 pounds meal mixture less per 100 pounds fat produced. The cows increased in production on fish meal and dropped very perceptibly when again placed on gluten. A very noticeable feature was the greatly stimulated appetites and the increased weights of all cows when on fish meal.

On a basis of milk production in these trials the following meal equivalents are seen:—

1. 110 pounds fish meal plus 45 pounds bran plus 22 pounds oats equal 215 pounds gluten.
2. 166 pounds cottonseed meal plus 50 pounds bran plus 24 pounds oats equal 215 pounds gluten.
3. 188 pounds linseed oil meal plus 3 pounds bran plus 2 pounds oats equal 215 pounds gluten.
4. 147 pounds peanut oil meal plus 51 pounds bran plus 25 pounds oats equal 215 pounds gluten.

As an example of cash value, giving a value per ton of \$60 for gluten, \$70 for oats and \$35 for wheat bran, then this brand of fish meal has a value of \$89 per ton for milk production alone when fed in this proportion.

During this trial the cows made a most noticeable gain in weight on fish meal, namely, 37 pounds per animal in 14 days, and at the same time more than maintaining a normal milk flow. Judging from this, a good brand of fish meal should be excellently suited to the feeding of beef animals.

Another trial with fish meal was made in 1917 with a "Fish Meal Cattle Feed" supplied by the Canada Commission of Conservation. This feed contained 67 per cent fish meal. Owing to some very unexplainable quality the cows persistently refused this feed when given as a 5 per cent addition to the regular ration, hence no definite results as to its food value were obtained.

Generally speaking, a good brand of fish meal, when judiciously fed, is not only a most profitable feed in milk or meat production, but is also a splendid appetizer and has no detrimental effect on the flavour of the meat or milk. This is surely a time in Canadian history when this product should be generally appreciated, manufactured and utilized to best advantage.

SUMMARY.

The waste of fish and fish scrap in Canada is enormous. Here is a supply of cheap feed as yet but little appreciated or developed.

Concentrated meals are scarce and often not available. Fish meal, where available, is a suitable concentrate for cattle, and especially for hogs.

Fish meal is very rich, containing 55 per cent to 60 per cent of protein and over 15 per cent phosphate of lime.

If of good quality and properly fed with other meals and with roughages, it is fairly palatable, wholesome, and a good feed for young, growing stock and also for milk production, having no injurious effects on the meat or milk.

The greater demand for this valuable feed would greatly stimulate its manufacture.

When given a fair trial and used in proper proportions it should become one of the most popular and profitable protein supplements for swine feeding.



